



The Bulletin 440

The Royal Society of New South Wales

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March 2020

For Your Diary:

Friday 6 March 2020

Frontiers of Science Forum

A joint forum presented by the
Royal Society of NSW, the
Teachers' Guild of NSW, the
Australian Institute of Physics,
and the Royal Australian
Chemical Institute

Venue: Boston University Campus,
15–25 Regent Street, Chippendale
(For more information, see p. 4)



Patron of The Royal Society of NSW
Her Excellency The Honourable Margaret
Beazley AO QC
Governor of New South Wales

1281th OGM & Open Lecture

Soils: the least understood part of science, yet vital for all of us.

Wednesday, 4 March 2020



Professor Robin J Batterham AO

See page 3 for more information

Date: Wednesday, 4 March February 2020, 6 for 6.30pm

Venue: Gallery Room, State Library of NSW (Entrance:
Shakespeare Place, Sydney)

Entry: \$25 for Non-Members, \$15 for Fellows, Members and
Associate Members of the Society, \$5 Students (including a
welcome drink)

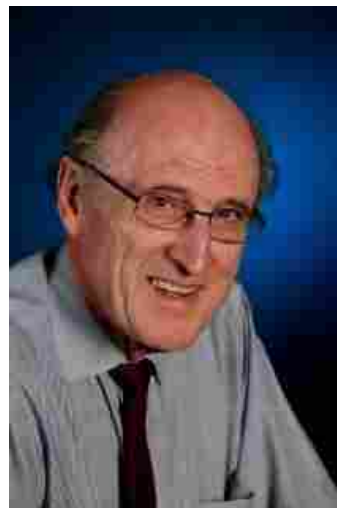
Dress Code: Smart Casual

Dinner (Including Drinks): \$120 for Non-Members, \$100 for
Fellows, Members and Associate Members, \$75 for students.
Reservations close Monday, 2 March at 9:30am.

Enquiries: RSNSW Secretariat Phone: 9431 8691

All are welcome: [Click Here to Register](#).

From the President



World of Challenges

I have been reflecting, as perhaps you have too, that these days our nation and our world seem to have more than their fair share of problems. Some that come to mind are Covid 19 pandemic, weather extremes (drought and floods), bushfires, land degradation, climate change, trade wars, faltering economy, religiously motivated violence (fortunately not in Australia), rising inequality, challenging reports of decline in school attainment, increasing instances of poor air quality, pollution of the oceans poor river health (think of fish kills), and many others. Many of the problems are interconnected – think of bushfires, poor air quality, and a drying and warming climate in Eastern Australia. Others are exacerbated by the increasingly connected nature of our world – think of the public health challenges posed by increasing global air travel, and the economic hazard of our large dependence on international students and tourists. While the Royal Society is unlikely to solve any of these great problems, you may be sure that over the coming year the Royal will be exploring many of these problems and their complex interconnections. Let's hope we can also contribute to solutions.

Watch this space!

Ian H. Sloan AO FAA FRSN
President
Royal Society of New South Wales
President@royalsoc.org.au

Soils: the least understood part of science, yet vital for all of us

Professor Robin J Batterham AO

Kernot Professor of Engineering, University of Melbourne



Wednesday
4 March 2020

Venue: Gallery Room, State
Library of NSW

6:00pm for 6.30pm
Cost: \$25 for Non-Members, \$15
for Fellows, Members and
Associate Members of the Society,
\$5 Students

The decadal plan for agriculture from our Academy of Science suggests that soils are the least understood part of all science. In this talk we will explore how, if we approach the stewardship of our country differently (and many already are) we can improve our drought resilience, have fewer challenges with run off (save the reef), use fewer farm chemicals, produce zero emission products such as meat and, if we get it right, sequester around 40% of Australia's emissions. The science to do this is innovative and multifaceted. The talk will end with an invitation that, whether we live in cities or in the country, we all have a role to play.

Professor Batterham AO is a former Chief Scientist of Australia and President of the Academy of Technological Sciences and Engineering, and is presently the Kernot Professor of Engineering at the University of Melbourne. He is a Fellow of the Australian Academy of Science, the Academy of Technological Sciences and Engineering, and The Royal Academy of Engineering, amongst others, and holds Honorary Doctorates from the University of Melbourne, the University of Technology Sydney, and the University of Queensland. Most recently, he has had leadership roles at the interface of University, Industry and Government in areas that include mining, mineral processing, and algal and energy systems. Presently, he is the Chair of the Australia-India Strategic Research Fund, the Chair of the Australia-China Strategic Research Fund, the Chair of the Australian Chamber Choir, and a Member of the International Mineral Processing Council.

Frontiers of Science Forum 2020

“Exploring major discoveries and theories in physics, mathematics,
biology and chemistry”



**Friday
6 March 2020**

**Venue: Boston University
Sydney Campus. 15–25
Regent Street, Chippendale**

**5:15pm for 6:00pm
Cost: No charge
Registration: by Thurs 5
March via Currinda**

**Professor Ben Eggleton, University of Sydney
Professor Mary Myerscough, University of Sydney
Julianna Kadar, Macquarie University
Professor Richard Payne, University of Sydney**

Ever since the Copernican revolution in the 16th century, science has been progressing at an exponential rate. Major discoveries and theories in physics, mathematics, biology and chemistry have shaped our existence and civilisation, and continue to grow exponentially. The Frontiers of Science forum will present four international experts who will speak on current and upcoming developments in their fields.

[New frontiers in photonics—the science of light](#)

Professor Ben Eggleton, School of Physics & Nano Institute, University of Sydney

[The mathematics of health honey bee hives](#)

Professor Mary Myerscough, School of Mathematics & Statistics, University of Sydney

[Fitbits for sharks: combining biology and data science](#)

Ms Julianna Kadar, Department of Biological Sciences, Macquarie University

[Drug discovery inspired by natural products](#)

Professor Richard Payne, School of Chemistry, University of Sydney

Annual Meeting of the Four Societies 2020

'Challenges for the Future: Energy Storage and Waste Plastic — Two Australian Solutions Going Global'



**Thursday
12 March 2020**

**Venue: Metcalfe
Auditorium, State Library
of NSW, Macquarie
Street, Sydney**

**6:00pm for 6:30pm
Cost: \$20 (inc
refreshments)**

Professor Thomas Maschmeyer FAA FTSE FMAE FRSN School of Chemistry, University of Sydney

In any discussion of a sustainable future, two issues loom large. First, how do we store the energy from Australia's abundant renewable resources? Second, how do we deal with the growing mountain of plastic waste?

As it happens, two technological breakthroughs addressing these issues have been developed in Australia by companies co-founded by our speaker, Prof. Thomas Maschmeyer, Professor of Chemistry at the University of Sydney:

- A zinc-bromide battery, Gelion's Endure, and
- Licella's Cat-HTR Technology, a chemical recycling process, which turns plastic waste into fuels, waxes, and new plastics that can be recycled again and again.

Prof. Maschmeyer will discuss these within their respective contexts of a changing energy landscape and the circular economy. He will briefly review the status quo in each field and current projections of where the fields as a whole are headed, paying particular attention to the Australian perspective. Within ten years, 8% of the world's expected battery storage will be located here. With huge resources of energy and space, so close to Asia, Australia has a great opportunity to process plastic wastes, uplift their value and send the intermediate products for further refining into new plastics, chemicals, and fuels offshore.

Hunter Branch Meeting March - 2020

“Planetary Health: Safeguarding Health in the Anthropocene Epoch”



Wednesday 25th March 2020

Venue: Newcastle City Hall,
290 King Street, Newcastle,
NSW 2300

5:00pm for a Hunter Branch
Meeting, 5:30pm for the
Lecture

Cost: General entry, \$15;
Student concession, \$5

Professor Tony Capon Monash

Sustainable Development Institute, Monash University

Professor Tony Capon directs the Monash Sustainable Development Institute and holds a chair in planetary health in the School of Public Health and Preventive Medicine at Monash University. A public health physician and authority in environmental health and health promotion, his research focuses on urbanisation, sustainable development and human health. He is a former director of the International Institute for Global Health at United Nations University (UNU-IIGH) and has previously held professorial appointments at the University of Sydney and Australian National University. He is a member of the Rockefeller Foundation–Lancet Commission on Planetary Health that published its report Safeguarding human health in the Anthropocene epoch in 2015, and the International Advisory Board for The Lancet Planetary Health.

Two of his recent publications are:

- ‘Advancing Planetary Health in Australia: focus on emerging infections and antimicrobial resistance.’ Hill-Cawthorne et al. *BMJ Global Health* (2019)4(2) e 001283
- ‘Human Health on an Ailing Planet’ - Historical Perspectives on Our Future.’ Dunk JH et al. *NEJM*, 2019, 381(8):778-782

Advance Notice -
Southern Highlands Lecture
Thursday 19 March 2020

Professor Geordie Williamson

Professor of Mathematics / Director of the Mathematical
Research Institute at the University of Sydney

'Light, sound & the magic of the Fourier transform'



Thursday 19 March 2020

**Venue: Mittagong RSL.
Lecture 6:00pm for 6.30pm**

Why do guitars, flutes and voices sound different? How do we hear the different notes in a piece of music? What would music look like if we could see it? Most importantly, what does this have to do with the cover of Pink Floyd's "The Dark Side of the Moon"? Join Professor Geordie Williamson for a journey into the shape of sound and sound waves to explore the fascinating world of timbre, overtones, modes and frequencies.

Geordie Williamson grew up in the Southern Highlands of New South Wales, Australia. He was an undergraduate at the University of Sydney, and completed his PhD at the University of Freiburg in Germany. Following his PhD studies he was a Junior Research Fellow at Oxford for three years, and then an Advanced Researcher at the Max Planck Institute for Mathematics in Bonn. In 2020/21 he will direct a year long program at the Institute for Advanced Study in Princeton. Geordie is the Youngest living Fellow of The Royal Society.

Report of the 1280th OGM
Wednesday 12 February 2020

Presentations by the 2019 Royal Society of NSW Scholarship Recipients



Royal Society of NSW Scholarship recipients Emma Austin, Thomas Pettit, Shyam Balaji and Michael Papanicolao with Emeritus Professor Robert Clancy and Vice President Ms Judith Wheeldon

Emeritus Professor Robert Clancy introduced the presentations that were given by the four winners of the 2019 Royal Society of NSW Scholarships.

[Emma Austin, University of Newcastle](#)

Drought and wellbeing in Australian rural communities: implications for improving adaptive capacity and resilience to drought

Ms Austin's research investigates the relationship between drought and wellbeing in rural communities in NSW, taking into account the links between wellbeing and adaptive capacity, and the need for the successful adaptation to drought together with increased resilience which is essential for the survival of rural communities.

[Shyam Balaji, University of Sydney](#)

Searches for Extended Higgs Sectors, Flavour Physics Anomalies and Dark Matter at the Large Hadron Collider (LHC)

Mr Balaji's research is in the field of particle physics which explores the fundamental building blocks of the Universe and the interactions between them. The focus of his work, as a member of the ATLAS Collaboration at CERN's LHC, is in testing exotic Higgs boson models and extensions to the Standard Model of Particle Physics.

Report of the 1280th OGM
Wednesday 12 February 2020

Presentations by the 2019 Royal Society of NSW Scholarship Recipients (continued)

(Continued...)

[Michael Papanicolao, University of Technology Sydney and the Garvan Institute of Medical Research](#)

Charting the Extracellular Matrix Through Breast Tumour Progression

Mr Papanicolao's research involves investigations into the role of the extracellular matrix (ECM) in breast tumour progression. The focus of his work is on charting how the ECM evolves with tumour progression, using protein mass spectrometry and advanced imaging to identify targetable proteins that are important in breast cancer metastasis.

[Thomas Pettit, University of Technology Sydney](#)

Botanical biofilters for the phytofiltration of urban air pollutants

Mr Pettit's research is in the field of biofilter technology, in which he has been developing and assessing the use of active green walls to clean the air of active pollutants to provide functional reductions of air pollution in zones where they are most needed.

New Fellows & Members

At the **February OGM** Fellowships were awarded to Emeritus Professor Thomas John Boulton FRACP, Professor Clare Elizabeth Collins FDAA, Distinguished Professor Karu Priyathama Esselle FIEEE, Emeritus Professor Brian James Fraser FAS, Professor Jeanette Susanne Lechner-Scott, Professor Belinda Elizabeth Medlyn, Professor Shinichi Nakagawa, Professor Catherine Joanna Stevens, Professor Ngamta Thamwattana. New members include Dr John Flachs, Mr Andrew Freeman & Dr Sonja Van Wichelen



Vice-President, Ms Judith Wheeldon AM FRSN congratulates **Mr Matthew Richardson** on becoming a member

Mr Nigel Kuan receives his membership certificate from Vice President Ms Judith Wheeldon



Report of 20th February 2020

Royal Society of NSW

Southern Highlands Branch

Scientia Professor Martina Stenzel's

Liversidge Lecture



This year's winner of the Liversidge medal, Professor Martina Stenzel, presented a fascinating story – a story with two strands: One, her own professional journey from early school days in Germany through a succession of university studies, ending up as a post-doctoral researcher at UNSW two decades ago, up to her present position as Scientia Professor, and with numerous awards along the way.

The other strand was the story of the development of polymers, long rows of linked organic molecules, which started with a challenge, in the 1860's, to make synthetic billiard balls as a replacement for ivory balls. However, the winner, who pocketed \$10,000 in prize money, had little idea of what was taking place in the mixture of materials he had come up with in a cut-and-try process, and it was not until 1920 that the theoretical foundations of polymerisation were established.

There followed the development of numerous materials through polymerisation, which we know under the collective term of “plastics” today, but in these materials the length of polymers would vary immensely, from a few hundred to a hundred thousand of the organic building blocks, whereas the polymers found in Nature (and there are many of them) all have very definite lengths. Through studying them, it was found that by adding a certain type of molecule to the polymerising mixture, the length could be controlled reasonably accurately. With this, the basis was established for Martina's main interest – the creation of nano-sized polymers with various shapes, one of which is a sphere or ball, with a core of hydrophobic material and an outer shell of hydrophilic material. As cancer drugs are mostly hydrophobic, they can be embedded in the core, and by attaching particular molecules to the polymers making up the shell, the nanoparticles will attach themselves predominantly to cancer cells, penetrate the cells, and release the drug.

Report of Thursday 20 February 2020
Royal Society of NSW
Southern Highlands Branch

Professor John Thompson
(Retired) Head of the Sydney Melanoma Unit

‘Melanoma Detection and Treatment’



Professor Thompson commenced his lecture outlining why he had chosen to describe the current melanoma situation in Australia as an epidemic. Australia and New Zealand have the highest incidence rates of melanoma in the world, the lifetime risks of melanoma in Australia (to age 85) being now 1 in 13 for men and 1 in 21 for women. On average, one Australian will die every five hours from melanoma. These statistics readily lead to the conclusion that the occurrence of melanoma in Australia, particularly in older men, can be justifiably classed as an epidemic. Melanoma is the third most common cancer in Australian men, after prostate and colorectal cancer. In women, it is also the third most common form of cancer after breast and colorectal cancer.

Over the past five years, the use of surgery plus additional treatments has significantly extended life expectancy in patients with advanced melanoma disease where the cancer has spread to other parts of the body. These situations may require treatments such as chemotherapy, radiotherapy, immunotherapy or targeted molecular therapy. Professor Thompson spent some time describing Sentinel node biopsy, a process followed when a higher risk primary melanoma has been diagnosed after initial biopsy. This treatment, pioneered by Thompson and his team, determines whether the melanoma has spread to the surrounding lymph nodes. The process of Sentinel node biopsy starts with lymphatic mapping to identify the first “downstream” node – the sentinel node. Discoveries such as this have led to less radical surgery in recent years.

Now Online

Royal Society of NSW Journal and Proceedings

vol. 152, part 2, 2019

The December 2019 (and latest) issue of the *Journal & Proceedings* is now [on-line](#), the printed version is being mailed out to subscribers. There are **six papers**: three submitted, two commissioned, and one a reprint.

Topics include:

- The fragment of a Hebrew book found in the binding of a C17th book in Fisher Library,
- The science of red meat in NSW,
- The first drawings in the Colony of Botany Bay,
- Measuring the speed of light and how this led to Einstein's breakthroughs,
- An historical review of the development of plastics (polymers), and the psychology of perception in Aboriginal bark paintings.

There are **five PhD thesis abstracts**, and an obituary of historian Ann Moyal FRSN.

The Proceedings include the **2019 award winners** and the **newly gazetted Fellows of the Society**.

The Royal Society of NSW

“... for the encouragement of studies and investigations in Science Art Literature and Philosophy ...”

Royal Society of NSW

Other News

- **Interested in nominating for Council?** Please send your submission to royalsoc@royalsoc.org.au before close of business **12 March 2020**. Nomination forms have recently been emailed to all members by the Society. Positions will be appointed at the upcoming Annual General Meeting in April.
- The Society has appointed **Ms Wendy Enevoldsen** to the position of part-time Executive Officer from 22 January.
- **Dr Rebecca Johnson FRSN, Chief Scientist at the Australian Museum** and a leading koala conservation expert, has just been appointed to the highly prestigious post of Chief Scientist and Associate Director at the Smithsonian National Museum of Natural History in Washington DC.
- **Emeritus Professor Heinrich Hora FRSN (see below)** made the headlines in The Australian (21 February 2020, page 8) with his brilliant idea of using the latest advances in laser technology to produce fusion energy without the massive amounts of heat needed in other methods. The method is focussed on the safe hydrogen-boron reaction using lasers. According to Hora, “his reactor design is simple. It consists of a metal sphere, where a modestly sized HBII fuel pellet is held in the centre and blasted with two lasers. One laser establishes the magnetic containment field for the plasma and the other triggers the avalanche fusion reaction”. The method promises to achieve very low carbon emissions by 2050 and a good supply of energy.



Emeritus Professor Heinrich Hora FRSN

News to share?

Feel free to send through relevant news which may be of interest to fellow members, to Bulletin Editor
Tim Humphrey
timh@spatialgroup.com.au



Changed your email address?

Let's keep in touch

Please let the office know if your contact details have changed. royalsoc@royalsoc.org.au

RSNSW Coming Events

Date	Event	Speakers	Topics and Presentations	Location
4 Mar 20	Ordinary General Meeting	Professor Robin J Batterham AO	Soils: the least understood part of science, yet vital for all of us	State Library of NSW
6 Mar 20	Frontiers of Science Forum:	Various	"Exploring major discoveries and theories in physics, mathematics, biology and chemistry"	Boston University Campus
12 Mar 20	Annual meeting of the four societies	Various	'Challenges for the Future: Energy Storage and Waste Plastic — Two Australian Solutions Going Global'	State Library of NSW
19 Mar 20	Joint Event with SMSA	Henry Carmichael Dr Lesley Scanlon	On the Shoulders of Giants	SMSA, 280 Pitt Street
25 Mar 20	Hunter meeting	Prof Tony Capon Monash	'Planetary Health: Safeguarding health in the Anthropocene Epoch'	Newcastle City Hall

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